

What is claimed is:

1. A detecting system for a container's location comprising:

a plurality of CCD cameras disposed vertically downward on a hoisting accessory, which is mounted on a crane for conveying containers, and photographing a plurality of corner fittings mounted on the upper surface of a container to be loaded and unloaded (container load cargo), respectively;

a distance finder for determining a distance between said hoisting accessory and said container load cargo;

an image processor for image-processing video signals from said CCD cameras to detect two-dimensional coordinates of said corner fittings on the upper surface of said container load cargo; and

an arithmetic and control unit for performing an arithmetical operation of a three-dimensional relative position on the surface of said container load cargo with respect to said hoisting accessory on the basis of the two-dimensional coordinates of said plurality of corner fittings on the upper surface of said container load cargo, which were detected by said image processor, as well as distance information indicating a distance between said hoisting accessory and said container load cargo, which was determined by said distance finder;

whereby a three-dimensional relative position defined between said hoisting accessory and said container load cargo is detected.

2. A detecting system for a container's location comprising:

a plurality of CCD cameras disposed vertically downward on a hoisting accessory, which is mounted on a crane for conveying containers, and photographing a plurality of corner fittings mounted on the upper surface of a container load cargo, respectively;

a plurality of illuminating light sources disposed vertically downward on said hoisting accessory and for illuminating said plurality of corner fittings mounted on the upper surface of said container load cargo, respectively;

a distance finder for determining a distance between said hoisting accessory and said container load cargo;

an image processor for image-processing video signals from said CCD cameras to detect two-dimensional coordinates of said corner fittings on the upper surface of said container load cargo; and

an arithmetic and control unit for performing an arithmetical operation of a three-dimensional relative position on the surface of said container load cargo with respect to said hoisting accessory on the basis of the two-dimensional coordinates of said plurality of corner fittings on the upper surface of said container load cargo, which were detected by said image processor, as well as distance information indicating a distance between said hoisting accessory and said container load cargo, which was determined by said distance finder;

whereby a three-dimensional relative position defined between said hoisting accessory and said container load cargo is detected.

3. A detecting system for a container's location as claimed

in claim 2, comprising further a controller for adjusting outputs of said plurality of illuminating light sources based on the distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder.

4. A detecting system for a container's location as claimed in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which image-processes video signals from said CCD cameras to detect a region wherein said corner fittings are located, and prepares template images on the basis of said results detected.

5. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which image-processes video signals from said CCD cameras to detect a region wherein said corner fittings are located, and prepares template images on the basis of said results detected.

6. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which image-processes video signals from said CCD cameras to detect a region wherein said corner fittings are located,

and prepares template images on the basis of said results detected.

7. A detecting system for a container's location as claimed in claim 4 wherein:

said image processor is the one for updating sizes of said template image on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by the use of the template images thus updated and input images represented by the video signals from said CCD cameras in accordance with template matching processing.

8. A detecting system for a container's location as claimed in claim 5 wherein:

said image processor is the one for updating sizes of said template image on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by the use of the template images thus updated and input images represented by the video signals from said CCD cameras in accordance with template matching processing.

9. A detecting system for a container's location as claimed in claim 6 wherein:

said image processor is the one for updating sizes of said template image on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by

the use of the template images thus updated and input images represented by the video signals from said CCD cameras in accordance with template matching processing.

10. A detecting system for a container's location as claimed in claim 4 wherein:

said image processor is the one for changing sizes of input images represented by the video signals from said CCD cameras on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by the use of the input images the sizes of which were thus changed and said template images thus updated in accordance with template matching processing.

11. A detecting system for a container's location as claimed in claim 5 wherein:

said image processor is the one for changing sizes of input images represented by the video signals from said CCD cameras on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by the use of the input images the sizes of which were thus changed and said template images thus updated in accordance with template matching processing.

12. A detecting system for a container's location as claimed in claim 6 wherein:

said image processor is the one for changing sizes of input

images represented by the video signals from said CCD cameras on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to detect said corner fittings on the upper surface of said container load cargo by the use of the input images the sizes of which were thus changed and said template images thus updated in accordance with template matching processing.

13. A detecting system for a container's location as claimed in claim 1 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

14. A detecting system for a container's location as claimed in claim 2 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

15. A detecting system for a container's location as claimed in claim 3 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of

distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

16. A detecting system for a container's location as claimed in claim 4 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

17. A detecting system for a container's location as claimed in claim 5 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

18. A detecting system for a container's location as claimed in claim 6 wherein:

said plurality of CCD cameras are the ones each for changing automatically a photographing magnification on the basis of distance information indicating a distance between said hoisting accessory and said container load cargo determined by said distance finder to keep a size of an input image represented by video signals from said CCD cameras always constant.

19. A detecting system for a container's location as claimed in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which stores a region wherein said corner fittings each having a size in response to distance information indicating a distance between said hoisting accessory and said container load cargo have been located as a template image.

20. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which stores a region wherein said corner fittings each having a size in response to distance information indicating a distance between said hoisting accessory and said container load cargo have been located as a template image.

21. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing or the like processing, which stores a region wherein said corner fittings each having a size in response to distance information indicating a distance between said hoisting accessory and said container load cargo have been located as a template image.

22. A detecting system for a container's location as claimed



in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said corner fittings reside in case of implementing said template matching processing, executing template matching processing by the use of template images for detecting hole parts of a plurality of corner fittings, which have been previously prepared in the restricted region to detect hole central positions in the corner fittings, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

23. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said corner fittings reside in case of implementing said template matching processing, executing template matching processing by the use of template images for detecting hole parts of a plurality

of corner fittings, which have been previously prepared in the restricted region to detect hole central positions in the corner fittings, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

24. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said corner fittings reside in case of implementing said template matching processing, executing template matching processing by the use of template images for detecting hole parts of a plurality of corner fittings, which have been previously prepared in the restricted region to detect hole central positions in the corner fittings, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

25. A detecting system for a container's location as claimed in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings

in said every container load cargos; and

said preparation means is the one for executing template matching processing by the use of template images for detecting hole parts of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to detect hole central positions in the corner fittings in case of implementing said template matching processing, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

26. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings in said every container load cargos; and

said preparation means is the one for executing template matching processing by the use of template images for detecting hole parts of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to detect hole central positions in the corner fittings in case of implementing said template matching processing, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

27. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of corner fittings in said every container load cargos; and

said preparation means is the one for executing template matching processing by the use of template images for detecting hole parts of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to detect hole central positions in the corner fittings in case of implementing said template matching processing, and preparing template images of the corner fittings on the basis of the hole central positions of said corner fittings thus detected.

28. A detecting system for a container's location as claimed in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said corner fittings reside in case of implementing said template matching processing, and executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously

prepared in the restricted region, to prepare template images of the vicinities of the holes of the corner fittings.

29. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said corner fittings reside in case of implementing said template matching processing, and executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously prepared in the restricted region, to prepare template images of the vicinities of the holes of the corner fittings.

30. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos; and

said preparation means is the one for image-processing video signals from said CCD cameras to restrict a region wherein said

corner fittings reside in case of implementing said template matching processing, and executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously prepared in the restricted region, to prepare template images of the vicinities of the holes of the corner fittings.

31. A detecting system for a container's location as claimed in claim 1 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos; and

said preparation means is the one for executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to prepare template images of the vicinities of the holes of the corner fittings in case of implementing said template matching processing.

32. A detecting system for a container's location as claimed in claim 2 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos;

and

said preparation means is the one for executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to prepare template images of the vicinities of the holes of the corner fittings in case of implementing said template matching processing.

33. A detecting system for a container's location as claimed in claim 3 wherein:

said image processor is the one for detecting said corner fittings on the upper surface of said container load cargo in accordance with template matching processing, which involves a preparation means for preparing template images of vicinities of holes of corner fittings in said every container load cargos; and

said preparation means is the one for executing template matching processing by the use of template images for detecting vicinities of holes of a plurality of corner fittings, which have been previously prepared with respect to video signals from said CCD cameras to prepare template images of the vicinities of the holes of the corner fittings in case of implementing said template matching processing.